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10/687,068	10/16/2003	Paul A. Reid	47181-00278USPT	8901

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EXAMINER	
BAUER, SCOTT ALLEN	
ART UNIT	**PAPER NUMBER**
2836	

DATE MAILED: 05/30/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

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Office Action Summary	Application No. 10/687,068	Applicant(s) REID ET AL.	
	Examiner Scott Bauer	Art Unit 2836	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-8* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *3,4,7 and 8* is/are allowed.

6)☐ Claim(s) *1,2,5 and 6* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *16 October 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *1/12/2004*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The disclosure is objected to because of the following informalities: Page 4 line 29 of the specification refers to the manual test circuit as reference number 18. However, it is believed that Applicant intended to label the manual test switch as 22. As the reference number 18 is not contained in figure1, the specification or the figure should be amended.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1 & 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Howell (US 4,150,411) in view of Anderson (US 6,434,715) and further in view of Banu et al. (US 2001/002123).

4. With regard to Claim 1, Howell, in Fig. 1, teaches a signal processor system for detecting ground-fault and grounded-neutral conditions in an electrical power distribution system having line and neutral conductors (column 1 lines 6-15) comprising: a sensor circuit containing a single current transformer (DX) producing an output signal

responsive to current flow in both the line and neutral conductors of the electrical power distribution system (column 5 lines 1-6), a signal processor (14) for receiving said sensor output signal and initiating the generation of a trip signal upon detection of said ground-fault or said grounded-neutral condition in said power distribution system (column 5 lines 6-19), said signal processor using said sensor output signal to detect ground-fault conditions during spaced time intervals (column 8 lines 24-47), and using said sensor output signal to detect grounded-neutral condition during intervening time intervals between said spaced time intervals (column 8 lines 51-57), and a circuit interrupter (20 & TC) for interrupting current flow in said power distribution system in response to said trip signal. Howell further teaches an analog memory function set in response to detection of a ground-fault or grounded-neutral condition to resume a circuit trip if power is temporarily lost before said circuit interrupter activates. Howell teaches that over many samples, an analog memory comprising a capacitor (C1) and resistor (R1) is charged in the event of a fault. In a prolonged fault, the capacitor will eventually charge and trip the circuit (column 9 lines 21-41). The charge would necessarily be maintained in the event of a momentary power loss.

Howell does not teach that the signal processor is a microcontroller. Howell further does not teach that the analog memory circuit provides a timing function to control said spaced time intervals and said intervening time intervals.

Anderson teaches a circuit interrupter to protect against fault conditions wherein a microcontroller is used to detect fault currents from a current sensor and to trip the circuit if a fault is detected (column 1 lines 15-28).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Howell with Anderson, by implementing the threshold detector circuits (38 & 44) of Howell as firmware in a microprocessor as taught by Anderson to receive a sensor output signal from the amplifier (22) and generating a trip signal upon the detection of an over current condition for the purpose of reducing the size and complexity of the circuit.

Banu et al. teaches a sampling device wherein an analog memory (20) is used to control the timing of the sampling period (paragraph 0010).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Howell with Banu et al., by replacing the sampling circuit of Howell (S & 34) with the sampling circuit of Banu by sampling the sensor output signal between the amplifier (22) and capacitor (C1) using an analog memory contained in the analog memory circuit, to control said spaced time intervals and said intervening time intervals of Howell, for the purpose of providing a simple sampling device that reduces aliasing errors.

5. With regard to Claim 5, Howell teaches a method of detecting ground-fault and grounded-neutral conditions in an electrical power distribution system having line (L) and neutral (N) conductors, comprising: producing a signal with a single current transformer (DX), responsive to current flow in both the line and neutral conductors of the electrical power distribution system (column 5 lines 1-6), supplying said signal to a signal processor that is designed to use said signal to detect ground-fault or grounded-

neutral conditions in said power distribution system and initiate the generation of a trip signal upon detection of said ground-fault or grounded-neutral condition, interrupting the current flow in said power distribution system in response to said trip signal, and using an analog memory (R1 & C1) to provide a memory function set in response to detection of a ground-fault or grounded-neutral condition to resume a trip condition if power is temporarily lost before said current flow in said power distribution system is interrupted as described above in item number 4.

Howell does not teach that the signal processor is a microcontroller. Howell further does not teach that the analog memory circuit provides a timing function to control said spaced time intervals and said intervening time intervals.

Anderson teaches a circuit interrupter to protect against fault conditions wherein a microcontroller is used to detect fault currents from a current sensor and to trip the circuit if a fault is detected (column 1 lines 15-28).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Howell with Anderson, by implementing the threshold detector circuits (38 & 44) of Howell as firmware in a microprocessor as taught by Anderson to receive a sensor output signal from the amplifier (22) and generating a trip signal upon the detection of an over current condition for the purpose of reducing the size and complexity of the circuit.

Banu et al. teaches a sampling device wherein an analog memory (20) is used to control the timing of the sampling period (paragraph 0010).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Howell with Banu et al., by replacing the sampling circuit of Howell (S & 34) with the sampling circuit of Banu by sampling the sensor output signal between the amplifier (22) and capacitor (C1) using an analog memory contained in the analog memory circuit, to control said spaced time intervals and said intervening time intervals of Howell, for the purpose of providing a simple sampling device that reduces aliasing errors.

6. Claims 2 & 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Howell (US 4,150,411) in view of Anderson (US 6,434,715).

7. With regard to Claim 2, Howell teaches a signal processor based system for detecting ground-fault and grounded-neutral conditions in an electrical power distribution system having line (L) and neutral (N) conductors comprising: a sensor circuit (DX) containing a single current transformer that necessarily varies non-linearly with temperature, producing an output signal responsive to current flow in both the line and neutral conductors of the electrical power distribution system (column 5 lines 1-19), a signal processor (14) receiving said sensor output signal and initiating the generation of a trip signal upon detection of said ground-fault or said grounded-neutral condition in said power distribution system wherein said signal processor is designed during manufacture to receive said sensor output signal at a given temperature, and provide a predetermined ground-fault threshold value based on said sensor output and store said

predetermined ground-fault threshold value in a threshold detector (38), and provide a predetermined grounded-neutral threshold value based on said sensor output and store said predetermined grounded-neutral threshold value in a second threshold detector (44).

Howell does not teach that the system contains a microcontroller or that the circuit contains a non-volatile memory to be programmed in which the predetermined fault thresholds can be computed and stored.

Anderson teaches a circuit interrupter to protect against fault conditions wherein a microcontroller is used to detect fault currents from a current sensor and to trip the circuit if a fault is detected. Anderson further teaches that the microcontroller comprises a ROM and EEPROM, which is non-volatile memory for storing application code including initialization parameters and operational parameters (column 1 lines 15-28).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Howell with Anderson, by implementing the signal processor taught by Howell on a microcontroller as taught by Anderson and to compute and store the predetermined fault thresholds of Howell in the ROM and EEPROM of Anderson during manufacture for the purpose of reducing the size of the circuit and to allow for the changing of operational parameters to meet the different applications of the user.

8. With regard to Claim 6, Howell teaches a method of detecting ground-fault and grounded-neutral conditions in an electrical power distribution system having line and

neutral conductors, comprising: producing a signal with a single current transformer (DX), that necessarily varies non-linearly over temperature, which is responsive to current flow in both line (L) and neutral (N) conductors of said electrical power distribution system, and supplying said signal to a signal processor (14) that is designed during manufacture to receive said signal at a reference temperature, which is the temperature at which the circuit was designed and tested, and provide a predetermined ground-fault threshold value based on said reference temperature, and store said predetermined ground-fault threshold value in a threshold detector (38) associated with said signal processor, and receive said signal at a reference temperature, which is the temperature in which the circuit is designed and tested, and provide a predetermined grounded-neutral threshold value based on said temperature reference, and store said predetermined grounded-neutral threshold value in a threshold detector (44) associated with said signal processor (14).

Howell does not teach that the system contains a microcontroller or that the circuit contains a non-volatile memory to be programmed in which the predetermined fault thresholds can be computed and stored.

Anderson teaches a circuit interrupter to protect against fault conditions wherein a microcontroller is used to detect fault currents from a current sensor and to trip the circuit if a fault is detected. Anderson further teaches that the microcontroller comprises a ROM and EEPROM, which is non-volatile memory for storing application code including initialization parameters and operational parameters (column 1 lines 15-28).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Howell with Anderson, by implementing the signal processor taught by Howell on a microcontroller as taught by Anderson and to compute and store the predetermined fault thresholds of Howell in the ROM and EEPROM of Anderson during manufacture for the purpose of reducing the size of the circuit and to allow for the changing of operational parameters to meet the different applications of the user.

Allowable Subject Matter

9. Claims 3, 4, 7 & 8 are allowed.

10. Claim 3 is allowable because the prior art of record does not teach or fairly suggest a ground fault current interrupter wherein a microcontroller is programmed to calculate a modified ground-fault threshold value based on a predetermined ground-fault threshold value and the output of an ambient temperature sensing circuit, and calculate a modified grounded-neutral threshold value based on a predetermined grounded-neutral threshold value and the output of an ambient temperature sensing circuit, and use said modified ground-fault threshold value to detect a ground-fault condition, and use said modified grounded-neutral threshold value to detect a grounded-neutral condition.

Howell teaches a system to detect ground fault and grounded neutral conditions using a sensor comprising a single current transformer that varies with temperature.

Howell further teaches using a predetermined ground fault threshold and a predetermined grounded neutral threshold and that these thresholds can be used to initiate the generation of a trip signal upon detection of the ground fault and grounded neutral conditions, to interrupt current flow in a power distribution system. Howell does not teach however, that a modified threshold level is used with the predetermined threshold, to calculate a modified threshold value.

Yalla et al. (US 5,224,011) teaches a microcontroller based protective relay system that interrupts current in the event of a sensed fault. Yalla et al. teaches that a temperature sensor is placed in proximity to a current transformer, wherein the sensor sends a signal to a microcontroller. The microcontroller uses the signal to determine a proper error correction factor to compensate for the error in the temperature sensor caused by ambient temperature (column 18 lines 60-68). However, Yalla et al. does not teach that the error correction is used to calculate a modified threshold to trip a breaker.

11. Claim 4 is allowable because the prior art of record does not teach or fairly suggest a ground fault circuit interrupter wherein a microcontroller is used to measure a frequency of a resonant oscillation to determine a change in the inductance of a current transformer, calculate a modified ground-fault threshold value based on said predetermined ground-fault threshold value and said change in the inductance of said current transformer, calculate a modified ground-fault threshold value based on said grounded-neutral threshold value and said change in the inductance of said current transformer, use said modified ground-fault threshold value to detect said ground-fault

condition, use said modified grounded-neutral threshold value to detect said grounded-neutral condition.

Howell teaches that a circuit is used to sense ground fault and grounded neutral conditions using a single current transformer with inductance that varies with temperature wherein the circuit contains a predetermined ground fault threshold and predetermined grounded neutral threshold, and a resonant circuit which is excited with a signal generated by a signal processor to create a resonant oscillation during a ground neutral test (column 9 lines 21-40). Howell further teaches that the circuit interrupts the distribution system when a trip signal is generated.

However, Howell teaches that the amplitude of the resonant oscillation is used to determine a ground fault, and does not teach that the frequency is measured to determine a change in the inductance of the current transformer.

12. Claim 7 is allowable because the prior art of record does not teach or fairly suggest a ground fault circuit interrupter wherein a microcontroller is used to program an ambient temperature reading to calculate a modified ground-fault threshold value based on a predetermined ground-fault threshold value, use the ambient temperature reading to calculate a modified grounded-neutral threshold value based on a predetermined grounded-neutral threshold value, use a signal to detect ground-fault conditions based on said modified ground-fault threshold value, and use said signal to detect grounded-neutral conditions based on said modified grounded-neutral threshold value.

Howell teaches a system to detect ground fault and grounded neutral conditions using a sensor comprising a single current transformer that varies with temperature. Howell further teaches using a predetermined ground fault threshold and a predetermined grounded neutral threshold and that these thresholds can be used to initiate the generation of a trip signal upon detection of the ground fault and grounded neutral conditions, to interrupt current flow in a power distribution system. Howell does not teach however, that a modified threshold level is used with the predetermined threshold, to calculate a modified threshold value.

Yalla et al. (US 5,224,011) teaches a microcontroller based protective relay system which interrupts current in the event of a sensed fault. Yalla et al. teaches that a temperature sensor is placed in proximity to a current transformer, wherein the sensor sends a signal to a microcontroller. The microcontroller uses the signal to determine a proper error correction factor to compensate for the error in the temperature sensor caused by ambient temperature (column 18 lines 60-68). However, Yalla et al. does not teach that the error correction is used to calculate a modified threshold to trip a breaker.

13. Claim 8 is allowable because the prior art of record does not teach or fairly suggest a ground fault circuit interrupter wherein a microcontroller measures the frequency of a damped oscillation to determine a change in the inductance of a current transformer, calculates a modified ground-fault threshold value based on a predetermined ground-fault threshold value and said change in the inductance of said

current transformer, calculates a modified ground-fault threshold value based on a grounded-neutral threshold value and said change in the inductance of said current transformer, uses said modified ground-fault threshold value to detect a ground-fault condition, and uses said modified grounded-neutral threshold value to detect a grounded-neutral condition.

Howell teaches that a circuit is used to sense ground fault and grounded neutral conditions using a single current transformer with inductance that varies with temperature wherein the circuit contains a predetermined ground fault threshold and predetermined grounded neutral threshold, and a resonant circuit which is excited with a signal generated by a signal processor to create a resonant oscillation during a ground neutral test (column 9 lines 21-40). Howell further teaches that the circuit interrupts the distribution system when a trip signal is generated.

However, Howell teaches that the amplitude of the resonant oscillation is used to determine a ground fault, and does not teach that the frequency is measured to determine a change in the inductance of the current transformer.

Conclusion

14. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Engel (US 4,180,841) and Sircom (US 3,794,884) teaches ground fault circuit interrupters wherein a single current transformer is used to detect both ground faults and grounded neutral conditions wherein the transformer is pulsed to

create a ring oscillation in the current transformer for detecting the grounded neutral fault.

Simmel (US 4,616,423), Murphy et al. (US 5,428,495), Weir (US 5,644,510) and Brooks (US 6,313,642) disclose fault detection systems which use external analog memories along with microcontrollers to store information in the event of power loss, such as a temperature curve, or to indicate the time lapse of the power loss period to the microcontroller upon power up (Murphy et al. column 2 lines 57-65).

Hakkarainen (US 5,675,336) teaches an analog memory unit (14) which would be operable in both a half-wave and full-wave power supply. Hakkarainen further teaches that analog memory circuits are often used in controllers that may lose power and that when power is cut off to the controller, it is often preferable to retain information used by the controller in a circuit breaker (column 1 lines 9-17).

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Scott Bauer whose telephone number is 571-272-5986. The examiner can normally be reached on M-F 8am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Brian Sircus can be reached on 571-272-2058. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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22 MAY 06

Chau Nguyen

CHAU N. NGUYEN
PRIMARY EXAMINER